

Summary Progress Report, October 2014:

Title: *Identifying essential spawning habitats for improving assessment and management of the market squid fishery off California.*

Research Project: Funded in March 2014 by the NMFS Habitat Assessment Improvement Plan (HAIP).

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During the spring, summer and fall of 2014 various surveys were implemented to achieve the goals of the *Market Squid Paralarvae Abundance and Natal Habitat* research project. These cruises were conducted in collaboration between the SWFSC (La Jolla and Santa Cruz laboratories), California Department of Fish and Wildlife (CDFW) and the California Wetfish Producer's Association (CWPA). The primary objectives of this project are to identify the most productive spawning grounds of market squid off California, and to better understand the dynamics of this species as related to retrospective habitat use. Specifically, we aim to: (1) relate seasonal changes in the quality of market squid spawning habitat to abundance, growth and mortality rate, and recruitment; and (2) model squid movement among major spawning grounds in southern, central and northern California. Ultimately, we expect to identify the habitats that contribute most recruits to the exploitable biomass, potentially leading to more sustainable management of the squid stock off California. Three fishing vessels chartered out of Oxnard, Santa Barbara, and Moss Landing conducted sampling surveys in southern California during the spring 2014, and in both southern California and Monterey Bay in summer and fall 2014 (Figure 1). Additional surveys will be conducted in these areas by the same vessels in December 2014 and in January 2015 to complete the market squid fishery season off California. Market squid samples were also collected during the 2014 SWFSC DEPM, juvenile rockfish, and sardine and hake surveys. The chartered vessels conducted surveys in inshore shallower waters, where NOAA cruise ships typically cannot sample. During the 2014 surveys:

- Paralarval samples were collected in spring, summer and fall 2014 onboard the chartered vessels. All of these samples have been sorted and the abundance of paralarvae in spring and summer 2014 is summarized and compared to previous data collected by CWPA from 2011-2013 (see Figure 2). Preliminary analyses showed that the relative abundance of paralarvae in southern California was lower in 2014 than in the 2011-2013 period, likely due to warmer oceanic conditions;
- Water samples were collected in summer and fall 2014. In total, 69 samples of water were processed and are now being analyzed for trace elements, nutrients, and oxygen and carbon stable isotope ratios at the Environmental Laboratory Facility of UMass Boston;
- Juvenile squid were collected during the spring 2014 DEPM and juvenile rockfish surveys;
- Adult squid were collected by CDFW from port landings in northern, central and southern California;
- Additional squid samples were collected in northern California, Oregon and Washington during the summer hake and sardine survey. Analysis of statoliths from these areas will help identifying potential unfished spawning habitats that may supply recruits to the California market squid fishery;
- Statoliths from paralarvae, juveniles and adult squid are being processed and aged at the SWFSC laboratory;

- Underwater cameras were utilized to monitor market squid spawning habitat in Monterey Bay during the summer and fall surveys (Figure 3).

Future Plans:

- Water and paralarval samples will be collected in December 2014 and January 2015 at sampling stations in Monterey Bay and in southern California (see Figure 1);
- Juvenile squid will be collected during the 2015 spring DEPM and rockfish surveys conducted by the SWFSC;
- Adult squid will be collected monthly from port landings by CDFW, and during the 2015 sardine and hake survey;
- Continue processing, ageing and chemical analysis of statoliths, and modeling;
- Continue monitoring market squid habitat in Monterey Bay using underwater cameras;
- Present preliminary results at the 2014 CalCOFI meeting in La Jolla, CA (December 8-10, 2014), based on the 2014 data collection;
- Present preliminary results at the 2015 AFS meeting in Portland, OR (August 16-20, 2015) based on the 2014 and 2015 data collection;
- Submission of next progress report in March 2015.

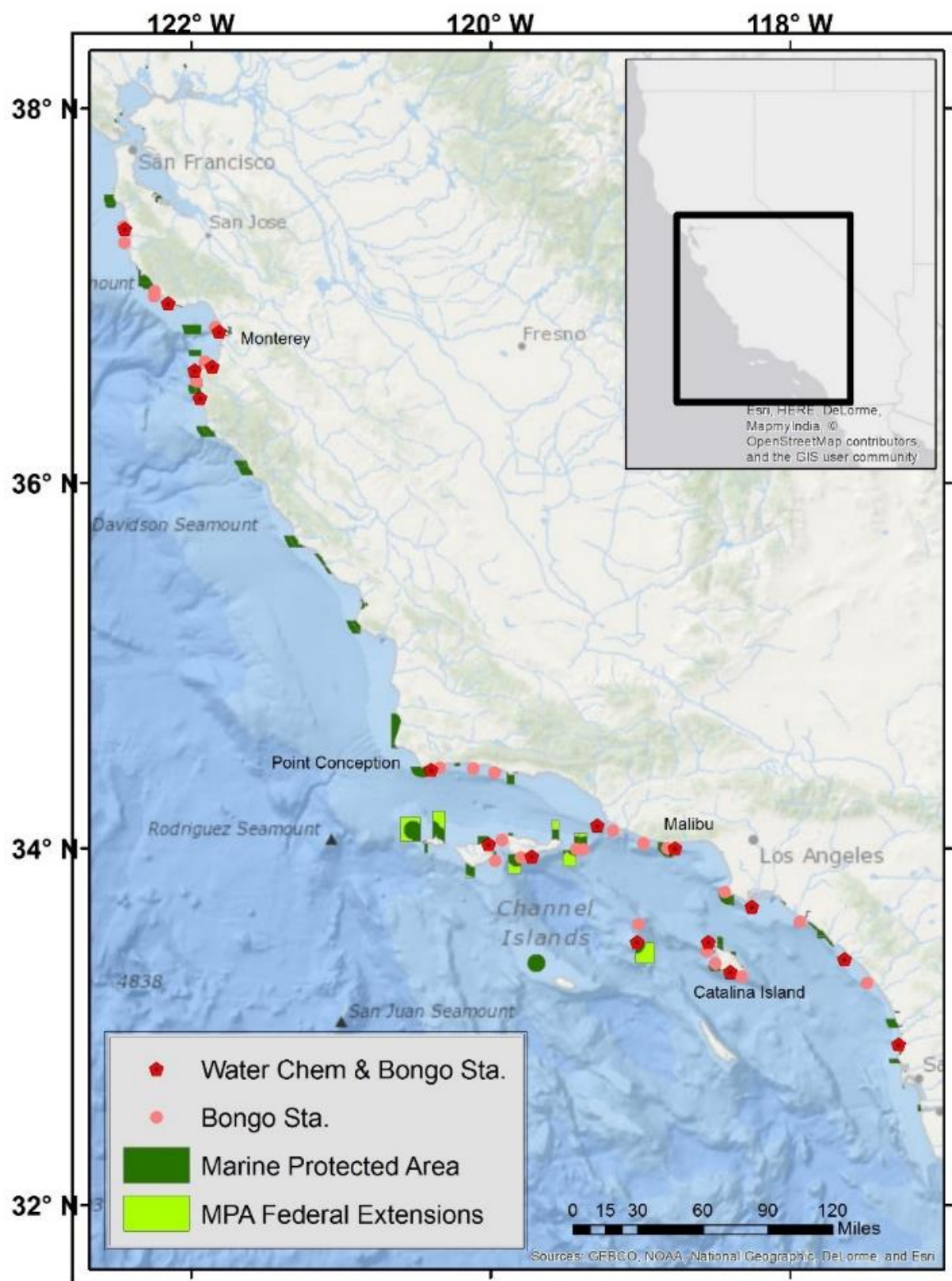


Figure 1. Sampling stations off of California, 2014.

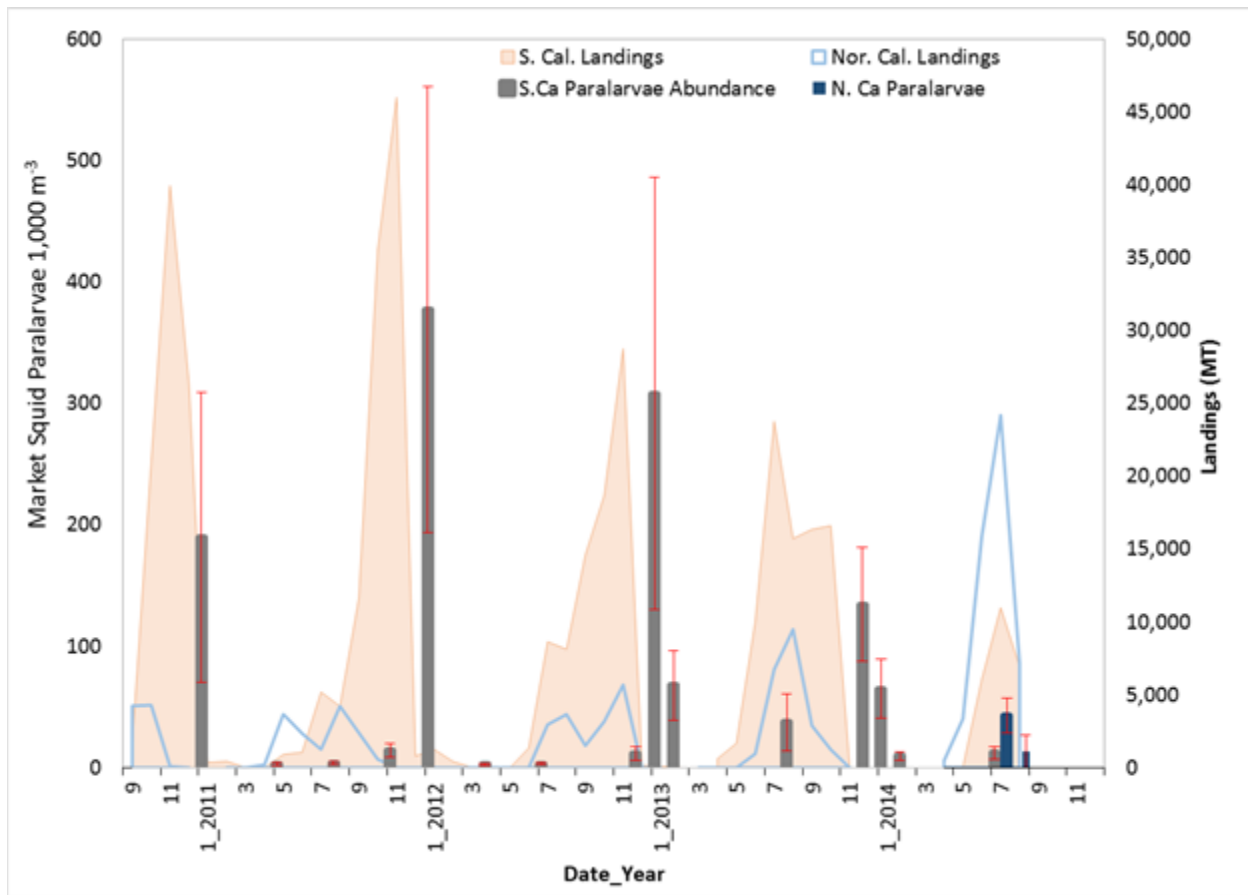


Figure 2. Seasonal abundance of market squid paralarvae and port landings in 2014 compared to 2011-13 CWPA surveys.



Figure 3. Image from underwater camera shows egg capsules of varying maturity videoed in August 2014 within Monterey Bay, California. White capsules are relatively fresh, while opaque capsules are closer to maturation.